

## **Investigation of a Site with PCB DNAPL in Fractured Rock**

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General Electric manufactured capacitors at the GE Hudson Falls site from 1952 to 1994. Previously, the site was also occupied by paper mills and foundries. Until 1977, the PCB dielectric fluid (primarily Arochlor 1242) used in the capacitors was refined onsite to a high degree of purity. After 1977, other dielectric fluids were substituted for PCBs.

Over the years, a phased investigation approach was taken to determine the extent of soil and ground-water contamination at the site. The initial PA/SI began in 1987 focused on the overburden and shallow bedrock. As work on the RI progressed in the early 1990's, it was apparent that DNAPL and LNAPL were present in shallow bedrock (25-40 feet below ground surface, or bgs) and DNAPL extended to one deeper bedrock well (65-86 feet bgs). Ground water from the overburden was also found to be hydraulically connected to the air plenum and return air duct beneath Building 1. Two thrust faults were identified in the underlying Snake Hill Shale, potentially affecting lateral DNAPL migration. In subsequent years, the RI was expanded to investigate the Sumpter Street sewer and potential source areas beneath Building 1. In addition, access to the river bank and bottom became available in 1994 when the Hudson River was dewatered during construction of Baker's Dam, which allowed for inspection and DNAPL seep collection.

The RI results indicated that DNAPL migration extended to the Hudson River (although not to the western side of the river) and migrated downward through the Snake Hill Shale to the upper fractured portion of the underlying Glens Falls Limestone. Structures containing DNAPL beneath Building 1 were found to be directly open to the bedrock surface.

A pilot ground-water recovery system was subsequently installed in bedrock. Pumping of ground water initially resulted in the recovery of over 100 gallons of DNAPL. It was observed that the water level had to be adjusted in order to get the optimum DNAPL recovery. The pilot test was expanded to include additional recovery wells. The zone of hydraulic capture was established in the Snake Hill Shale along the Hudson River and captured 90% of the flow from the contaminated part of the site. Approximately 70% of the DNAPL recovered was from the Snake Hill Shale. Nearly 3,000 gallons of DNAPL was collected, primarily from bedrock recovery wells, by the end of 1997.

In total, the phased bedrock investigation from 1994 to 1997 resulted in the installation of 87 bedrock monitoring wells and 13 recovery wells. Supplemental investigations followed to determine the extent of DNAPL migration "upgradient" as well as downdip to the southeast. DNAPL was found beneath Baker's Falls but not found to have significantly migrated downdip;

Over the course of the RI process, a phased approach to the bedrock investigation was found to be essential to defining site conditions while allowing for agreement on the scope of work

between regulators and the responsible party. An earlier identification of the magnitude of the DNAPL problem, however, would have expedited focus on the evaluation of DNAPL migration pathways in bedrock. Identification of the thrust faults, which affected migration, helped to focus the location of monitoring and recovery wells. A significant finding resulting from the remedial work done at the site to date is that the use of dual-phase (DNAPL and groundwater) recovery systems has the potential to significantly increase the rate of DNAPL recovery from and influence the migration of DNAPL through fractured bedrock.